STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

MILFORD
13692B

March 3, 2016

ADDENDUM NO. 1

Bidders are hereby advised to make the following revisions to the Proposal and Plans:

1. **Replace**, in the Proposal, the **Information Report** (pages 1 through 4) with attached pages **1A through 4A** and the **Bid Schedule** (pages 310 through 323) with attached pages **310A through 323A**. The following charts are summaries of the revisions to the items and quantities:

   a. Delete Items:

Item Number	Description	Unit	Quantity
670.821	GNSS Machine Control Grading	U	1
670.822	GNSS Construction Inspection Equipment	U	1

   b. Add Items:

Item Number	Description	Unit	Quantity
1008.831	Alterations and Additions as Needed – GNSS Machine Control Grading	$	**$5,000**
1008.832	Alterations and Additions as Needed – Construction Inspection Equipment	$	**$25,000**

2. **Replace**, in the Proposal, page 178 with page 178A, which is the **ESAL** for this project. The correct grades of bituminous material to use for this project appear on page 179.

3. **Delete**, in the Proposal, pages 253 through 259, which is the special provision for **Item 670.821 – GNSS Machine Control Grading** and **Item 670.822 – GNSS Construction Inspection Equipment**.

4. **Insert**, in the Proposal, pages 283A through 283F, which is the special provision for **Item 1008.831 - Alterations and Additions as Needed – GNSS Machine Control Grading and Item 1008.832 - Alterations and Additions as Needed – GNSS Construction Inspection Equipment.**

5. **Amend**, in the back of the Proposal, on plan sheet 9A (Quantity Summaries), the ***Incidental Items*** summary with the following information:

   a. Delete Item:

Item Number	Description	Unit	Quantity
670.821	GNSS Machine Control Grading	U	1
670.822	GNSS Construction Inspection Equipment	U	1

   b. Add Item:

Item Number	Description	Unit	Quantity
1008.831	Alterations and Additions as Needed – GNSS Machine Control Grading	$	**$5,000**
1008.832	Alterations and Additions as Needed – Construction Inspection Equipment	$	**$25,000**

THE CONTRACTOR SHALL ACKNOWLEDGE THIS ADDENDUM ON THE BID ENVELOPE

Christopher M. Waszczuk, P. E
Director of Project Development

3/3/16
Date

State of New Hampshire
Department of Transportation

Information Report

Project:	MILFORD X-A003(007) 13692B
County and Code:	HILLSBOROUGH COUNTY 011
Date Bids Open:	MARCH 09, 2016
Scope of Work:	ROADWAY REHABILITATION
Location:	NH ROUTE 101 IN MILFORD
Completion Date:	OCTOBER 28, 2016
Proposal Guarantee:	5% OF BID AMOUNT
Federal Participation:	80%

FEDERALLY PARTICIPATING PROJECTS (PAR)

Item Number	Item Description	Unit	Estimated Quantity
202.6	CURB REMOVAL FOR STORAGE	LF	560.00
202.7	REMOVAL OF GUARDRAIL	LF	1112.50
203.1	COMMON EXCAVATION	CY	1600.00
203.35	HANDLING EXCAVATED, CONTAMINATED SOILS (DEPARTMENT DISPOSAL)	CY	1100.00
203.55553	GUARDRAIL EAGRT OFFSET PLATFORM, TL 2	U	2.00
203.6	EMBANKMENT-IN-PLACE (F)	CY	215.00
206.1	COMMON STRUCTURE EXCAVATION	CY	10.00
206.19	COMMON STRUCTURE EXCAVATION EXPLORATORY	CY	30.00
214.	FINE GRADING	U	1.00
304.3	CRUSHED GRAVEL (F)	CY	770.00
304.35	CRUSHED GRAVEL FOR DRIVES	CY	560.00
306.212	RECLAIMED STABILIZED BASE REMOVED AND REHANDLED 12 IN DEEP (F)	SY	13700.00
403.11002	HOT BITUMINOUS PAVEMENT, MACHINE METHOD (QC/QA TIER 2)	TON	5150.00
403.1109	HOT BITUMINOUS PAVEMENT, MACHINE METHOD, HIGH STRENGTH	TON	1350.00
403.12	HOT BITUMINOUS PAVEMENT, HAND METHOD	TON	370.00

403.4	MATERIAL TRANSFER VEHICLE (MTV)	TON	1350.00
403.6	PAVEMENT JOINT ADHESIVE	LF	33700.00
403.99	TEMPORARY BITUMINOUS PAVEMENT	TON	85.00
410.22	ASPHALT EMULSION FOR TACK COAT	GAL	1370.00
417.	COLD PLANING BITUMINOUS SURFACES	SY	600.00
603.0001	VIDEO INSPECTION	LF	590.00
603.00215	15" R.C. PIPE, 2000D	LF	510.00
603.11015	15" CORR. STEEL PIPE, .064"	LF	15.00
603.33212	12" CORR. POLYETHYLENE END SECTION	EA	2.00
603.82212	12" PE PIPE (TYPE S)	LF	70.00
604.0007	POLYETHYLENE LINER	EA	15.00
604.12	CATCH BASINS TYPE B, 4-FOOT DIAMETER	U	12.00
604.4	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET	LF	5.00
604.6	MANHOLE COVERS & FRAMES	EA	1.00
606.1255	BEAM GUARDRAIL (TERMINAL UNIT TYPE EAGRT, TL 2) (STEEL POST)	U	2.00
606.15809	STEEL BEAM GUARDRAIL, 7'-6" STEEL POSTS (NU-GUARD-31)	LF	3025.00
609.01	STRAIGHT GRANITE CURB	LF	1250.00
609.02	CURVED GRANITE CURB	LF	120.00
609.5	RESET GRANITE CURB	LF	130.00
609.924	SPECIAL STRAIGHT GRANITE CURB (REVEAL UP TO 12")	LF	85.00
611.90001	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS	EA	2.00
611.951	WATER MAIN INSULATION	SY	290.00
615.0301	TRAFFIC SIGN TYPE C	SF	95.00
615.033	REMOVING TRAFFIC SIGN, TYPE C	U	25.00
615.0601	TRAFFIC SIGN TYPE CC	SF	25.00
616.191	ALTERATIONS TO TRAFFIC SIGNALS	U	1.00
618.61	UNIFORMED OFFICERS WITH VEHICLE	$	17000.00
618.7	FLAGGERS	HR	2200.00
619.1	MAINTENANCE OF TRAFFIC	U	1.00
619.25	PORTABLE CHANGEABLE MESSAGE SIGN	U	2.00
621.2	RETROREFLECTIVE BEAM GUARDRAIL DELINEATOR	EA	35.00
621.31	SINGLE DELINEATOR WITH POST	EA	35.00
621.32	DOUBLE DELINEATOR WITH POST	EA	1.00
622.1	STEEL WITNESS MARKERS	EA	5.00

628.2	SAWED BITUMINOUS PAVEMENT	LF	1150.00
632.0104	RETROREFLECTIVE PAINT PAVE. MARKING, 4" LINE	LF	27000.00
632.3104	RETROREFLECT. THERMOPLAS. PAVE. MARKING, 4" LINE	LF	680.00
632.3118	RETROREFLECT. THERMOPLAS. PAVE. MARKING, 18" LINE	LF	75.00
632.32	RETROREFLECT. THERMOPLAS. PAVEMENT MARKING, SYMBOL OR WORD	SF	390.00
632.911	OBLITERATE PAVE. MARKING LINE, 12" WIDE & UNDER	LF	205.00
632.912	OBLITERATE PAVE. MARKING LINE, OVER 12" WIDE	LF	40.00
632.92	OBLITERATE PAVEMENT MARKING, SYMBOL OR WORD	SF	40.00
641.	LOAM	CY	155.00
644.82	SALT-TOLERANT GRASS SEED, TYPE 82	LB	15.00
645.3	EROSION STONE	TON	20.00
645.41	TEMPORARY SLOPE STABILIZATION TYPE A	SY	2650.00
645.43	TEMPORARY SLOPE STABILIZATION TYPE C	SY	590.00
645.512	COMPOST SOCK FOR PERIMETER BERM	LF	2600.00
645.531	SILT FENCE	LF	2600.00
645.7	STORM WATER POLLUTION PREVENTION PLAN	U	1.00
645.71	MONITORING SWPPP AND EROSION AND SEDIMENT CONTROLS	HR	240.00
646.3	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS	A	0.70
647.1	HUMUS	CY	210.00
670.066	MAILBOX SUPPORT ASSEMBLIES	EA	15.00
670.0661	MULTIPLE MAILBOXES SUPPORT ASSEMBLIES	EA	3.00
670.1611	DISCHARGE PERMIT FOR TREATING CONTAMINATED WATER	U	1.00
692.	MOBILIZATION	U	1.00
697.31	PROJECT OPERATIONS PLAN	U	1.00
698.14	FIELD OFFICE TYPE D	MON	9.00
699.	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL	$	4000.00
1008.831	ALTERATIONS AND ADDITIONS AS NEEDED - GNSS MACHINE CONTROL GRADING	$	5000.00
1008.832	ALTERATIONS AND ADDITIONS AS NEEDED - GNSS CONSTR INSPECTION EQUIPMENT	$	25000.00
1009.21	TREATMENT OR DISPOSAL OF CONTAMINATED GROUNDWATER (FRAC TANK)	$	10000.00

1010.15	FUEL ADJUSTMENT	$	20000.00
1010.2	ASPHALT CEMENT ADJUSTMENT	$	25000.00
1010.3	QUALITY CONTROL QUALITY ASSURANCE (QC/QA) ASPHALT	$	20600.00

Bid Schedule

Note: This proposal shall be prepared by the bidder, with the unit prices specified in both words and figures, and the extensions made by the bidder. For complete information concerning these items, see plans, special provisions, and standard specifications adopted in 2010.

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
202.6	560 LF	CURB REMOVAL FOR STORAGE at _____ _____ dollars per LF		
202.7	1112.5 LF	REMOVAL OF GUARDRAIL at _____ _____ dollars per LF		
203.1	1600 CY	COMMON EXCAVATION at _____ _____ dollars per CY		
203.35	1100 CY	HANDLING EXCAVATED, CONTAMINATED SOILS (DEPARTMENT DISPOSAL) at _____ _____ dollars per CY		
203.55553	2 U	GUARDRAIL EAGRT OFFSET PLATFORM, TL 2 at _____ _____ dollars per U		
203.6	215 CY	EMBANKMENT-IN-PLACE (F) at _____ _____ dollars per CY		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
206.1	10 CY	COMMON STRUCTURE EXCAVATION at _____ _____ dollars per CY		
206.19	30 CY	COMMON STRUCTURE EXCAVATION EXPLORATORY at _____ _____ dollars per CY		
214	1 U	FINE GRADING at _____ _____ dollars per U		
304.3	770 CY	CRUSHED GRAVEL (F) at _____ _____ dollars per CY		
304.35	560 CY	CRUSHED GRAVEL FOR DRIVES at _____ _____ dollars per CY		
306.212	13700 SY	RECLAIMED STABILIZED BASE REMOVED AND REHANDLED 12 IN DEEP (F) at _____ _____ dollars per SY		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
403.11002	5150 TON	HOT BITUMINOUS PAVEMENT, MACHINE METHOD (QC/QA TIER 2) at _____ _____ dollars per TON		
403.1109	1350 TON	HOT BITUMINOUS PAVEMENT, MACHINE METHOD, HIGH STRENGTH at _____ _____ dollars per TON		
403.12	370 TON	HOT BITUMINOUS PAVEMENT, HAND METHOD at _____ _____ dollars per TON		
403.4	1350 TON	MATERIAL TRANSFER VEHICLE (MTV) at _____ _____ dollars per TON		
403.6	33700 LF	PAVEMENT JOINT ADHESIVE at _____ _____ dollars per LF		
403.99	85 TON	TEMPORARY BITUMINOUS PAVEMENT at _____ _____ dollars per TON		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
410.22	1370 GAL	ASPHALT EMULSION FOR TACK COAT at _____ _____ dollars per GAL		
417	600 SY	COLD PLANING BITUMINOUS SURFACES at _____ _____ dollars per SY		
603.0001	590 LF	VIDEO INSPECTION at _____ _____ dollars per LF		
603.00215	510 LF	15" R.C. PIPE, 2000D at _____ _____ dollars per LF		
603.11015	15 LF	15" CORR. STEEL PIPE, .064" at _____ _____ dollars per LF		
603.33212	2 EA	12" CORR. POLYETHYLENE END SECTION at _____ _____ dollars per EA		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
603.82212	70 LF	12" PE PIPE (TYPE S) at _____ _____ dollars per LF		
604.0007	15 EA	POLYETHYLENE LINER at _____ _____ dollars per EA		
604.12	12 U	CATCH BASINS TYPE B, 4-FOOT DIAMETER at _____ _____ dollars per U		
604.4	5 LF	RECONSTRUCTING/ADJUSTING CATCH BASIN & DROP INLET at _____ _____ dollars per LF		
604.6	1 EA	MANHOLE COVERS & FRAMES at _____ _____ dollars per EA		
606.1255	2 U	BEAM GUARDRAIL (TERMINAL UNIT TYPE EAGRT, TL 2) (STEEL POST) at _____ _____ dollars per U		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
606.15809	3025 LF	STEEL BEAM GUARDRAIL, 7'-6" STEEL POSTS (NU-GUARD-31) at _____ _____ dollars per LF		
609.01	1250 LF	STRAIGHT GRANITE CURB at _____ _____ dollars per LF		
609.02	120 LF	CURVED GRANITE CURB at _____ _____ dollars per LF		
609.5	130 LF	RESET GRANITE CURB at _____ _____ dollars per LF		
609.924	85 LF	SPECIAL STRAIGHT GRANITE CURB (REVEAL UP TO 12") at _____ _____ dollars per LF		
611.90001	2 EA	ADJUSTING WATER GATES AND SHUTOFFS SET BY OTHERS at _____ _____ dollars per EA		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
611.951	290 SY	WATER MAIN INSULATION at _____ _____ dollars per SY		
615.0301	95 SF	TRAFFIC SIGN TYPE C at _____ _____ dollars per SF		
615.033	25 U	REMOVING TRAFFIC SIGN, TYPE C at _____ _____ dollars per U		
615.0601	25 SF	TRAFFIC SIGN TYPE CC at _____ _____ dollars per SF		
616.191	1 U	ALTERATIONS TO TRAFFIC SIGNALS at _____ _____ dollars per U		
618.61	17000 $	UNIFORMED OFFICERS WITH VEHICLE at _____ One _____ dollars per $	$1.00	$17,000.00

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
618.7	2200 HR	FLAGGERS at _____ _____ dollars per HR		
619.1	1 U	MAINTENANCE OF TRAFFIC at _____ _____ dollars per U		
619.25	2 U	PORTABLE CHANGEABLE MESSAGE SIGN at _____ _____ dollars per U		
621.2	35 EA	RETROREFLECTIVE BEAM GUARDRAIL DELINEATOR at _____ _____ dollars per EA		
621.31	35 EA	SINGLE DELINEATOR WITH POST at _____ _____ dollars per EA		
621.32	1 EA	DOUBLE DELINEATOR WITH POST at _____ _____ dollars per EA		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
622.1	5 EA	STEEL WITNESS MARKERS at _____ _____ dollars per EA		
628.2	1150 LF	SAWED BITUMINOUS PAVEMENT at _____ _____ dollars per LF		
632.0104	27000 LF	RETROREFLECTIVE PAINT PAVE. MARKING, 4" LINE at _____ _____ dollars per LF		
632.3104	680 LF	RETROREFLECT. THERMOPLAS. PAVE. MARKING, 4" LINE at _____ _____ dollars per LF		
632.3118	75 LF	RETROREFLECT. THERMOPLAS. PAVE. MARKING, 18" LINE at _____ _____ dollars per LF		
632.32	390 SF	RETROREFLECT. THERMOPLAS. PAVEMENT MARKING, SYMBOL OR WORD at _____ _____ dollars per SF		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
632.911	205 LF	OBLITERATE PAVE. MARKING LINE, 12" WIDE & UNDER at _____ _____ dollars per LF		
632.912	40 LF	OBLITERATE PAVE. MARKING LINE, OVER 12" WIDE at _____ _____ dollars per LF		
632.92	40 SF	OBLITERATE PAVEMENT MARKING, SYMBOL OR WORD at _____ _____ dollars per SF		
641	155 CY	LOAM at _____ _____ dollars per CY		
644.82	15 LB	SALT-TOLERANT GRASS SEED, TYPE 82 at _____ _____ dollars per LB		
645.3	20 TON	EROSION STONE at _____ _____ dollars per TON		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
645.41	2650 SY	TEMPORARY SLOPE STABILIZATION TYPE A at _____ _____ dollars per SY		
645.43	590 SY	TEMPORARY SLOPE STABILIZATION TYPE C at _____ _____ dollars per SY		
645.512	2600 LF	COMPOST SOCK FOR PERIMETER BERM at _____ _____ dollars per LF		
645.531	2600 LF	SILT FENCE at _____ _____ dollars per LF		
645.7	1 U	STORM WATER POLLUTION PREVENTION PLAN at _____ _____ dollars per U		
645.71	240 HR	MONITORING SWPPP AND EROSION AND SEDIMENT CONTROLS at _____ _____ dollars per HR		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
646.3	0.7 A	TURF ESTABLISHMENT WITH MULCH AND TACKIFIERS at _____ _____ dollars per A		
647.1	210 CY	HUMUS at _____ _____ dollars per CY		
670.066	15 EA	MAILBOX SUPPORT ASSEMBLIES at _____ _____ dollars per EA		
670.0661	3 EA	MULTIPLE MAILBOXES SUPPORT ASSEMBLIES at _____ _____ dollars per EA		
670.1611	1 U	DISCHARGE PERMIT FOR TREATING CONTAMINATED WATER at _____ _____ dollars per U		
692	1 U	MOBILIZATION at _____ _____ dollars per U		

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
697.31	1 U	PROJECT OPERATIONS PLAN at _____ _____ dollars per U		
698.14	9 MON	FIELD OFFICE TYPE D at _____ _____ dollars per MON		
699	4000 $	MISCELLANEOUS TEMPORARY EROSION AND SEDIMENT CONTROL at _____ One _____ dollars per $	$1.00	$4,000.00
1008.831	5000 $	ALTERATIONS AND ADDITIONS AS NEEDED - GNSS MACHINE CONTROL GRADING at _____ One _____ dollars per $	$1.00	$5,000.00
1008.832	25000 $	ALTERATIONS AND ADDITIONS AS NEEDED - GNSS CONSTR INSPECTION EQUIPMENT at _____ One _____ dollars per $	$1.00	$25,000.00
1009.21	10000 $	TREATMENT OR DISPOSAL OF CONTAMINATED GROUNDWATER (FRAC TANK) at _____ One _____ dollars per $	$1.00	$10,000.00

Item Number	Approximate Quantities	Items and Unit Prices Bid (F) - Final Pay Qty-See 109.11	Unit Prices Dollars | Cents	Amount Dollars | Cents
1010.15	20000 $	FUEL ADJUSTMENT at _____ One _____ dollars per $	$1.00	$20,000.00
1010.2	25000 $	ASPHALT CEMENT ADJUSTMENT at _____ One _____ dollars per $	$1.00	$25,000.00
1010.3	20600 $	QUALITY CONTROL QUALITY ASSURANCE (QC/QA) ASPHALT at _____ One _____ dollars per $	$1.00	$20,600.00

Grand Total $_____*
*Note: Grand total should also be entered on proposal cover.

04/09/09

SSD: 1/11/1999

MILFORD
13692B

March 2, 2016

S P E C I A L P R O V I S I O N

AMENDMENT TO SECTION 401 -- PLANT MIX PAVEMENTS - GENERAL

Items 403.XX - Hot Bituminous Pavement, XXXXXX (Superpave)

Add to 2.5.1:

2.5.1.1 The SUPERPAVE Mix Designs on this project shall utilize a 75 gyration N design mix.

S P E C I A L P R O V I S I O N

SECTION 1008 – ALTERATIONS AND ADDITIONS AS NEEDED

Item 1008.831 – Alterations and Additions as Needed - GNSS Machine Control Grading
Item 1008.832 - Alterations and Additions as Needed - GNSS Construction Inspection Equipment

Description

1.1 This specification contains requirements for grading construction projects using Global Navigation Satellite System (GNSS) machine control grading techniques. The Contractor shall use grading equipment controlled with a GNSS machine control system in the construction of the roadway design and build the required surface models to facilitate GNSS machine control grading. The Contractor may use any type of GNSS machine control equipment and systems that results in achieving the existing grading requirements and shall convert the electronic data provided by the Department into the format required by the machine control grading system.

1.2 Work shall consist of furnishing, configuring, installing, maintaining, and removing Global Navigation Satellite System (GNSS) equipment as needed for use by the Engineer and their inspection staff, including building the required surface models and downloading them into the Contractor provided data collectors, and the training of the Engineer and their representatives on the use of the GPS provided.

Equipment

2.1 The Contractor shall provide all equipment required to accomplish GNSS machine control grading and use that equipment to generate end results meeting all of the Contract requirements.

2.2 The GNSS Construction Inspection Equipment shall include all necessary components, communication devices, integrated antennae and receiver and cables, data collectors, operating manuals, attachments, and fastening hardware to meet the minimum requirements described below.

(a) GNSS equipment provided for a single Contract shall be the same model and manufacturer; and shall include, and be licensed to operate, the same version of GNSS planning/processing software (such as a Carlson product, Trimble Business Center HCE, or similar), and data collection software. This system to be utilized by the Contractor, Engineer, and their representatives for data collection shall be the same. All software provided (including firmware) shall be the most current available or in use by the Contractor. GNSS equipment shall be of the same age as those actively in use by the Contractor. To verify the age of the GNSS equipment, the Contractor shall provide a dated copy of the manufacturer's

receipt(s) for the purchase, lease, or rental of the equipment.

(b) GNSS equipment shall include both standard USB cable and Bluetooth wireless technology for data transfer between the GNSS equipment and the data collectors.

(c) GNSS equipment shall be equipped, at a minimum, to receive Global Positioning System (GPS) and GLONASS data.

(d) GNSS equipment shall be equipped to receive, and be capable of utilizing, Real Time Kinematics (RTK) correctional data (current version of RTCM format). This shall include all necessary communication devices, repeaters, and systems, data service plans, and communications to meet the minimum required accuracy and not exceed two (2) second latency at the rover. The Contractor shall ensure that the RTK data shall be available at all locations across the entire Contract site during all hours of construction and inspection operations.

(e) GNSS equipment shall include either an integrated or modular communication device capable of receiving RTK correctional data.

(f) GNSS Equipment shall be capable of collecting dual frequency GPS data.

(g) Minimum Required Kinematic Accuracy relative to primary project control (CORS):

(1) Horizontal: 10mm +1.0 ppm (0.033 ft +1.0 ppm)

(2) Vertical: 20mm + 1.0 ppm (0.065 ft + 1.0 ppm)

(h) Necessary hardware and software shall be included (including communication drivers) to connect the GNSS equipment to a Contractor-provided PC and communicate/exchange/process positional data with that Contractor PC. (Contractor-provided PC shall be the PC/Laptop provided under Item 698.__ - Field Office Type_, no additional PC/Laptops will be necessary.)

(i) GNSS equipment shall have an internal, or modular, rechargeable battery system capable of operating through all active working hours (may include interchangeable batteries), including the battery charger.

(j) GNSS equipment shall include a hard or soft shell carry cases, and all appropriate operation manuals.

(k) GNSS rover shall include one (1) fixed or collapsible height rover rod of two (2) meters (6.56 feet) in length, one attachable bipod which is compatible with the rover rod, and one Topo shoe.

(l) GNSS equipment set up to operate as a base stations shall include all necessary additional cables, hardware, fasteners, or accessories necessary to install it in a fixed semi–permanent location, will not be considered as a rover unit, and therefore will not require a rover, a bi- pod, or a Topo shoe.

(m) If a high accuracy machine control system is to be utilized for fine grading, a high accuracy measurement system shall be made available for Department use to check prepared fine graded surfaces. If the supplied GNSS unit is not capable of utilizing the high accuracy system, one that is shall be provided for the purposes of fine grade checking. This unit will not be considered an additional unit as it will only be made

available for fine grading purposes. High accuracy systems may include, but are not limited to, Laser Tied GPS and Ultimate Total Station machine guidance.

Construction Requirements

3.1 Department Responsibilities.

3.1.1 The Engineer will set the initial horizontal and vertical control points in the field for the project as indicated in the Contract Documents.

3.1.2 The Engineer will provide the project specific localized coordinate system. The control information utilized in establishing the localized coordinate system, specifically the rotation, scaling, and translation, can be obtained from the Engineer upon request.

3.1.3 The Department may have electronic data files available for the project. Any files available were originally created with the computer software applications MicroStation® (CADD software) and OpenRoads® (civil engineering software). The data files will be in the native formats and other software formats as described below. The Contractor will perform any and all necessary conversion of the files for the selected grade control equipment, including the creation of Digital Terrain Model(s) (DTM(s)) if necessary. The surface models provided by the Department will be, at a minimum, a finished grade model and a subgrade model from "edge of pavement" to "edge of pavement".

(a) CAD/D Files in DGN format.

(1) OpenRoads® terrain models representing the existing ground and design surfaces.

(2) OpenRoads® geometry files containing horizontal and vertical geometry.

(3) MicroStation® cross section design files.

(4) MicroStation® ROW design file.

(5) MicroStation® Existing Ground topography design file.

(b) Machine Control Surface Model Files.

(1) OpenRoads® terrain models in LandXML format (ASCII format).

(c) Alignment Data Files.

(1) Alignment Geometry Report (ASCII Report format).

(2) OpenRoads® geometry files in LandXML format (ASCII format).

3.1.4 The Contractor is notified that the Department utilizes the US Survey Foot as a basis for all engineering work. Particular care shall be taken to ensure that the US Survey Foot is utilized in any and all conversion/evaluation of the files provided. This includes any required conversion from MicroStation® DGN to AutoCAD® DWG; as well as from Bentley OpenRoads® to other engineering formats. The XML files shall also be checked to ensure that the US Survey Foot is utilized.

3.1.5 Any electronic project design data provided by the Department will not be deemed a part of the contract, and is supplied as a courtesy by the Department. The Contractor shall upon discovery of any ambiguity or error shall notify the Department before proceeding. The Contractor may convert any electronic data provided by the Department into a format required by the Contractor's system and equipment at the Contractor's expense. If not provided by the Department or changed from what was supplied, any Digital Terrain Model (DTM) to be used for construction shall be submitted to the Department as an OpenRoads terrain model or LandXML format at least 14 days prior to the pre-construction meeting; any other format shall be preapproved by the Department prior to submittal. The submission shall at minimum include a finished grade model and a subgrade model. No changes shall be made to any electronic model after submittal without prior written consent by the Project Engineer. The Department will review and provide comments to the Contractor within 14 days of receipt of the submittal.

3.1.6 The Contractor assumes all risk of error if the information is used for any purposes for which the information was not intended.

3.1.7 Any assumptions the Contractor makes from this electronic information is at their risk.

3.1.8 The Engineer will perform spot checks of the machine control grading results, surveying calculations, records, field procedures, and actual staking. If the Engineer determines the work is not being performed in a manner that will assure accurate results, the Engineer will order such work to be redone to the requirements of the Contract Documents at no additional cost to the Department.

3.2 Contractor Responsibilities.

3.2.1 The Contractor shall choose which communication technique and devices will be used which will insure the consistent and reliable delivery of RTK correctional data from the network to the GNSS equipment. When geographic locations or lack of reliable communications network prohibits the use of a network directly, the Engineer may approve the use of a Survey Grade GNSS Inspection unit as a base station in place of the network. The Contractor shall semi-permanently mount the base station in a stable and secure location where it shall not be disturbed by construction activities nor be easily damaged by vandalism, and where it shall be capable of providing radio signal coverage over the entire Contract area. A GNSS unit installed as a base station for inspection operations shall only be moved with the approval of the Engineer. Additional base station setups as required by the Engineer for areas outside the Contractors work area may be requested.

3.2.2 The Contractor shall build the required surface models and download them into the provided data collectors to facilitate construction inspection by the Engineer.

3.2.3 Provide the Engineer with a GNSS rover (with the same capabilities as equipment used by the Contractor) for use during the duration of the Contract. At the end of the Contract, the GNSS rover unit will be returned. Provide the Engineer 8 hours of formal training on the Contractor's GNSS machine control systems.

3.2.4 Review and apply the data the Department has provided to perform GNSS machine control grading and build the 3D model to do the same.

3.2.5 The Contractor bears all costs including but not limited to the cost of actual reconstruction of work that may be incurred due to errors in application of GNSS machine control grading techniques. Grade elevation errors and associated quantity adjustments resulting from the Contractor's activities area at no cost to the Department.

3.2.6 Convert the Department's electronic data into a format compatible with the machine control system.

3.2.7 Manipulation of the Department's electronic data is taken at the Contractor's own risk.

3.2.8 Check and recalibrate, if necessary, the GNSS machine control system at the beginning of each work day.

3.2.9 Meet the same accuracy requirements as conventional grading construction as required by the Standard Specifications.

3.2.10 Establish secondary control points at appropriate intervals and at locations along the length of the project and outside the project limits and/or where work is performed beyond the project limits as required at intervals as required for an adequate and accurate base station setup. Determine the horizontal position of these points using static GNSS sessions or by traverse connection from the original baseline control points. Establish the elevation of these control points using differential leveling from the project benchmarks, forming closed loops. Provide a copy of all new control point information to the Engineer prior to construction activities. The Contractor is responsible for all errors resulting from their efforts and shall correct all deficiencies to the satisfaction of the Engineer at no additional cost to the Department.

3.2.11 Preserve all reference points and monuments that are established by the Engineer within the project limits. Reestablish reference points that have not been preserved at no additional cost to the Department.

3.2.12 Set hubs at the top of the finished subgrade at all hinge points on the cross section at 1000 foot intervals on mainline and, if applicable, at least two cross sections on the side roads and ramps. Establish these hubs, using conventional survey methods, for use by the Engineer to check the accuracy of the construction.

3.2.13 Provide controls points and conventional grade stakes at critical points such as, but not limited to, PC's, PT's, super elevation points, and other critical points required for the construction of drainage and roadway structures.

3.2.14 At least one week prior to the preconstruction conference, submit to the Department for review a written machine control grading work plan which includes the equipment type, control software manufacture and version, and the proposed location of the local GNSS base station used for broadcasting differential correction data to rover unit(s).

3.2.15 The GNSS equipment shall be maintained and remain in service until either:

(a) A maximum of one week after the Engineer requests its removal in writing, or
(b) The Department relinquishes the Engineer's Field Office.

3.2.16 The Contractor shall maintain all GNSS equipment and software in good working condition and shall provide replacement due to breakdown, damage, or theft within two (2) working days. The Contractor shall retain ownership of all supplied GNSS equipment at the end of the Contract.

3.2.17 Training requirements are as follows:

(a) For all Construction Grade GNSS equipment, the Engineer and/or duly authorized representatives shall be provided with a minimum of two separate 8 hour minimum training sessions on the use and operation of the GNSS equipment and software during the first month of the Contract. One of the two classes shall occur within one week of delivery of GNSS equipment to the site. The second of the two classes shall occur at the request of the Engineer. If a Contract has multiple years of work, an additional 8 hour minimum training shall be provided at the request of the Engineer.

(b) All training shall be performed by a manufacturer–verified trainer who is approved by the Engineer. The training shall occur at the Engineer's Field Office or at a location agreed to by the Engineer.

Method of Measurement

4.1 Work authorized under this section will be measured as provided in 109.01; however when such work falls within the specifications for another item in the contract, the work will be measured according to the method of measurement for that contract item.

Basis of Payment

5.1 Payment for work authorized under this section will be made on a dollar basis according to 109.04. The dollar limit set in the proposal will not limit the Engineer in the value of work performed under this item.

5.1.1 Payment of the amount set in the proposal will not be on a lump sum basis, but only the amount determined for the value of work ordered will be paid.

5.1.2 Repair work to damaged or injured portions of the existing facilities made necessary due to the negligence of carelessness of the Contractor will not be paid for.

5.2 The Bidder's attention is called to the dollar amount inserted in the proposal under these items, which dollar amount is the allowance the Department has set up for the special work. This figure must not be altered by the Bidder on the proposal, and must be included to obtain the grand total of the bid.

Pay items and units:

1008.831	Alterations and Additions as Needed - GNSS Machine Control Grading	$
1008.832	Alterations and Additions as Needed - GNSS Construction Inspection Equipment	$